FLORA W. PATTERSON.

UNIVERSITY OF ARKANSAS
COLLEGE OF AGRICULTURE

Agricultural Experiment Station

13 JUL. 1921
OF MYCOLOGY

ARKANSAS PEACH DISEASES

J. A. Elliott

BULLETIN No. 149

FAYETTEVILLE, ARKANSAS
JUNE, 1918

The Bulletins of this Station are sent free to all residents of the State who request them.

UNIVERSITY OF ARKANSAS

AGRICULTURAL EXPERIMENT STATION

BOARD OF TRUSTEES

Governor Charles H. Brough, Chairman

Hon. J. K. Mahoney	Hon. Z. L. Reagan
Hon. H. L. Ponder	Hon. A. B. Banks
Hon. Frank Pace	Hon. J. D. Head
Hon. J. L. Bond	Hon. J. K. Browning

W. H. Cravens, Secretary

BOARD OF CONTROL

Committee on Agricultural College, President of the University, Director of the Station.

STATION STAFF

J. C. FUTRALL, President of the University
MARTIN NELSON, Director of the Station

G. G. Becker	Entomologist
J. R. Cooper	Horticulturist
H. E. Dvorachek	Animal Husbandman
J. A. Elliott	Plant Pathologist
R. M. Gow	Veterinarian
C. L. McArthur	Bacteriologist
Martin Nelson	Agronomist
J. B. Rather	Agricultural Chemist
Ruth Speerstra	Home Economics
W. E. Ayres	Assistant Agronomist
Ruth O. Dyche	Assistant Home Economics
W. S. Fields	Assistant Plant Pathologist
R. M. Koon	Assistant Horticulturist
F. H. Herzer	Assistant Animal Husbandman
Jean Hill	Assistant Home Economics
De F. Hungerford	Assistant Agronomist
C. B. Olney	Assistant Veterinarian
L. W. Osborn	Assistant Agronomist
R. H. Ridgell	Assistant Agricultural Chemist
H. A. Sandhouse	Assistant Animal Husbandman
R. G. Schriber	Assistant Veterinarian
S. R. Stout	Assistant Animal Husbandman

Correspondents should notify the Director of any change in post office address or failure or delay in receiving Bulletins.

MARTIN NELSON, Director,
Fayetteville, Arkansas.

ARKANSAS PEACH DISEASES

JOHN A. ELLIOTT

The 1917 peach crop in Arkansas amounted to 840,000 bushels, of which at least 10 percent was lost due to preventable diseases. Although the production was below normal, the prices paid made the crop very profitable where the losses due to disease were not too great. All of the peach diseases found in Arkansas may be controlled by nursery inspection, spraying and good cultural methods. In other words, the Arkansas peach grower need suffer very little loss if he recognizes the diseases and applies the proper remedies. No disease should be accepted as something the peach grower must endure as best he can, since each disease is due to some cause which is within his power to control.

The occurrence and importance of peach diseases in Arkansas have been ascertained by the Plant Pathology Department of the University of Arkansas through the Plant Disease Survey work which has extended over a number of years, and represents data collected by means of personal visits to various parts of the state in addition to hundreds of letters and diseased specimens sent in to the department every year. Some of the diseases are local but at the same time very severe in the communities where they occur; others are general throughout the state. The serious peach diseases found in Arkansas are Brown Rot, Black Spot or Bacteriosis, Scab, Leaf Curl, Crown Gall, Die Back and Sun Scald, Root Rot, and Wood Rots.

Brown Rot causes the heaviest losses of all the diseases found in the state. In many instances losses are from twenty to fifty per cent of the crop or even higher. One grower who in 1917 sold $18,000.00 worth of peaches paid $5,000.00 damage claims due to brown rot. Other growers lost as heavily or more heavily in proportion, while some communities, where spraying and better methods were practiced, lost nothing from this disease. Not all of the losses due to brown rot are borne by the grower. A large percentage of *apparently* sound peaches coming from orchards where brown

rot is prevalent *are sure to be already infected* and are almost sure to rot before reaching the consumer (Plate I, fig. 4). This loss may have to be borne by the transit company or the wholesaler because the rot did not show on the outside of the fruit at the time it was received at the shipping point. No matter who pays for the loss the grower is the only one who can control it.

Brown rot is caused by a fungus or brown mold known as *Sclerotinia cinerea*. It lives over in the orchard from year to year in old brown rot "mummies" (Plate I, fig. 3) and cankers on the limbs (Plate I, fig 2). Brown rot mummies which fall to the ground and become partly buried, in the second year produce what are known as apothecia, little funnel-shaped "mushrooms" which give off clouds of spores during damp warm weather and infect the blossoms or fruit. The fungus may attack peaches severely either at blossoming time, causing blighting of the blossoms, or at the time the fruit is ripening, causing serious rotting of the fruit. It may also attack the tender twigs at any time during the year when weather conditions are favorable to the fungus (Plate I, fig. 1), which requires damp warm weather to be a serious danger. The danger of serious damage is not over when the fruit is picked, as the fungus grows down through the blighted twigs or the stems of rotted peaches and causes cankers on the branches in which the fungus lives over until the next year, when it will attack the new crop.

Control of the disease: Mummies should not be allowed to hang on the trees but should be shaken off, raked up and burned, or plowed under so deeply that they cannot infect the next year's crop. Cankers should be cut out and the fruit protected by spraying. Self-boiled lime-sulphur (2% solution—16 pounds stone lime with enough water to start it slaking, add 16 pounds powdered sulphur and stir, adding water as needed until slaking is complete, add water to make 100 gallons) should be applied just as the blossoms are falling, two or three weeks later, and a few weeks before the fruit ripens. If the weather continues warm and moist it may be necessary to spray more often. Lead arsenate (3 lbs. paste, or 1½ lbs. dry, to 100 gallons) should be added to the spray to control insects (See Ark. Bul. No. 141). Soluble sulphur, commercial lime-sulphur, and Bordeaux mixture cause burning of the foliage unless diluted to such an extent as to be of no value in controlling the

disease. Dusting is still in the experimental stage. As the disease enters the fruit most readily through wounds, the control of scab and insects helps to control brown rot.

Black Spot or *Bacteriosis* affects both plums and peaches, causing "shot-holing" of the leaves, deforming of the fruit, and cankering of the twigs (Plate II, figs. 1-6). It is caused by a microscopic organism (*Bacterium pruni*) which is very generally distributed where plums and peaches are grown. In cases of severe attack the trees may lose all of their leaves early in the season and besides not properly maturing their fruit, are very much weakened and fail to store up food for the buds of the following year. Twigs and small branches are killed, and the trees, after several attacks, may die. This disease is apt to be very severe on neglected orchards.

Control. The disease does not attack a vigorously growing, healthy tree. If the lack of vigor is due to poor soil, applications of barnyard manure or sodium nitrate (3-5 lbs. per tree) will renew the growth and check the disease. On rich soil the disease may occur on trees weakened by borers or other troubles.

Scab. Peach scab causes losses due to its disfiguring effect on the fruit, uneven ripening, and cracking. It appears as dark green or black spots and blotches sometimes almost entirely covering the fruit, but more often affecting one side more than the other. In extremely severe attacks the fruit is rendered almost worthless (Plate III, fig. 4). It also affects the twigs and leaves, causing "shot-holing" of the leaves in some cases. Scab is caused by the fungus *Cladosporium carpophilum.* The disease is so common in Arkansas that many people consider it a natural marking of the peach, but where control measures are adopted the trouble does not appear. As the same spray which controls the brown rot will control the scab, a separate spray is not necessary. However, scab is less dependent on weather conditions for its atack and will appear in seasons when there is no brown rot, so that the scab spray may never be safely omitted.

Leaf Curl takes its name from the curling and blistering of the leaves and young twigs (Plate III, figs. 1-3). It sometimes affects the fruit. When severely attacked, trees lose their leaves early in the season, do not make proper growth or set fruit buds, and after a few years of severe infection usually die. The disease may first

appear on a few twigs of a single tree but it spreads quickly through the orchard unless control measures are used. Figure 3, of Plate III shows a young four-year-old peach orchard near Fayetteville Arkansas, almost ruined by leaf curl. Many trees were already dead and more than half were dying.

Control: "Spores" of the fungus live over from year to year on the outside of the buds and twigs, infecting the new growth as it starts in the spring. Either Bordeaux mixture or lime sulphur solution applied during the dormant season will control the trouble. Commercial lime sulphur, 8 percent solution (See Ark. Bul. No. 141), will control both the scale and leaf curl at the same application and is therefore preferable to Bordeaux mixture.

Crown Gall is another disease due to a bacterium (*Bacterium tumefaciens*). It causes large irregular growths often on the roots but usually at the crown just below the surface of the ground (Plate IV. figs. 1 & 2). A very large number of different plants are attacked, including most fruit trees, roses and briars. The disease is spread through nursery stock, and any stock showing abnormal growths on roots or crown should be refused. In Arkansas the grower is protected by the inspection of nursery stock, and no trees should be planted not bearing the stamp of the Chief Inspector of the Arkansas Plant Board. As there is no remedy for an infected tree, it should be dug up and burned. Since infection usually takes place through wounds, a new tree set where the diseased tree was removed should not have its roots pruned as this will increase the danger of infection.

Die Back and Sun Scald: These diseases are due to the same cause—fungus invasion following frost injury. The fungus (*Valsa leucostroma*) is always present and may infect any dead or weakened part of the tree from the twigs to the main limbs or trunk (Plate III, fig. 5). It may follow up and enlarges brown rot or bacteriosis cankers. There is some doubt whether it ever attacks a healthy tree. Sun scald is usually due to heavy freezing following a bright day in which the sap on the south side of the trunk and large limbs has been thawed. It can be best prevented by whitewashing the trunk and larger limbs early in the winter. Die Back of the twigs is lessened by proper pruning and general vigor of the tree. Frost injury was general in all parts of Arkansas in the winter of

1917-18. In many cases trees were entirely killed by the heavy freezing.

Root Rot is common only on heavy poorly drained soils or in land that is full of decaying roots of forest trees. It is due to a fungus producing an edible mushroom (*Armillaria mella*) which may sometimes be found in clusters at the base of the decaying tree. Usually no mushrooms are seen, but the tree dies, often a branch at a time, and when it is dug up the roots will be found to be rotted (Plate IV, fig. 4). The remedy lies in good drainage and in avoiding planting orchards in recently cleared lands unless all stumps have been removed.

Wood Rots. Peach trees are not usually much subject to wood rots, but under some conditions these may be very severe (Plate IV, figs. 3 & 5, Plate V, fig. 2). Several fungi have been found causing rots of peach trees in Arkansas. Among those which have been found destructive in certain sections are: *Coriolus versicolor, Pycnoporus Cinnabarinus,* and *Schizophylum communnae.* The attacks always occur through some wound which exposes the wood or through a dead branch or stub. A wound, caused by a broken branch, by severe cutting back, or by a dead stub left in pruning, is always open to infection. If trees are properly pruned each year so that "dehorning" is never necessary in order to get the growth of new wood nearer the ground (Plate V, fig. 1) no large wounds need be made that would be liable to infection. When large limbs are cut, however, no stub should be left, and the wound should be painted as a protection to the exposed wood. Plate IV, fig. 3, and Plate V, fig 2 show peach trees from an orchard at Cabin Creek, Arkansas, which have been severely "dehorned" and the wounds left unprotected. Although these trees have made a fine growth of vigorous new wood, a wood rot fungus (*Coriolus versicolor*) has entered through the cut ends of the old branches and entirely rotted the trunks of the trees. The first time this new wood sets a crop of fruit the trees will break to pieces, as some of the trees in this orchard had already done from the weight of the new growth alone.

Minor diseases. Frosty mildew (*Cercosporella Persica*) occurs commonly on nursery stock and on orchard trees in damp weather. It gets its name from the white growth of the fungus on the leaves, giving them the appearance of being covered with frost. Spraying

for other more serious diseases will control this disease. *Powdery mildew* (*Podosphaera Oxycanthae*) is more serious than the frosty mildew and in severe cases may cause the leaves to fall. It is similar in appearance to the frosty mildew but is more apt to cause dead dried out spots on the leaves. It may also occur on the fruit. It is controlled by the brown rot sprays. Nematodes or eel worms, which cause root knot of cotton and almost all vegetables, have been found causing root knot on peaches in a few sections of southern Arkansas. Trees become resistant as they get older.

Gummosis is not a disease in itself but is the result of some injury to the bark. Gum will flow from brown rot cankers, insect holes, broken twigs and many other injuries. The control of diseases and insect pests will prevent it.

No orchardist can hope to grow peaches profitably in Arkansas without using some definite means of controlling the many fungous and insect pests that attack his trees and fruit. Nothing will respond more quickly to care than will a peach tree, nor will any other tree fail more quickly through neglect. Although fewer sprayings are necessary, spraying should not be entirely neglected on years when there is no fruit. Cultivation and pruning should be as thorough on an "off" year as on any other year so that the tree may produce strong fruit buds for the following season. Every grower should have a spraying outfit (Plate V, fig. 3) or several spraying outfits if necessary, to take care of his orchard. Several good makes of machines in all sizes from hand power pumps to large motor power sprays are on the market, and can be purchased through any good hardware company.

EXPLANATION OF PLATES

(All photographs by Plant Pathology Department, Arkansas Experiment Station, except as noted below.)

PLATE I.

Fig. 1. Blossoms and tender shoots of peach attacked by the brown rot fungus.

Fig. 2. Brown rot cankers on peach twigs formed by the fungus growing down into the twig from the "mummied" fruit.

Fig. 3. Brown rot "mummy" hanging on a peach limb. A canker was being formed at the point of contact of the mummy and twig.

Fig. 4. Brown rotted peaches as they often reach their destination. This means a damage claim against the shipper or carrier. (After Scott, B. P. I. Bul. 174).

PLATE II.

Fig. 1. Cankers on peach twigs caused by *Bacterium pruni*. (Black spot or bacteriosis).

Figs. 2 & 3. Black spot on leaves of peach.

Fig. 4. Black spot cankers on two year old twigs. These are healing over.

Fig. 5. Black spot on Elberta peach, showing deformation.

Fig. 6. A peach deformed by black spot, cut open to show type of injury.

PLATE III.

Fig. 1. Peach leaf curl, showing deformed leaves.

Fig. 2. Peach leaf curl on Elberta peach. The blister-like elevation is due to the leaf curl fungus.

Fig. 3. Four year old peach orchard being killed by leaf curl. A large percentage of the trees were already dead.

Fig. 4. Scab on peach fruit. The peach on the left is cracked, due to the scab.

Fig. 5. Sun Scald and die-back cankers. Some of the cankers on the smaller limbs were undoubtedly started by brown rot.

PLATE IV.

Fig. 1. Crown gall on crown of young peach tree. This started at the graft.

Fig. 2. Crown galls on the trunk of young peach tree.

Figs. 3 & 5. A wood rot fungus (*Coriolus versicolor*) destroying "dehorned" peach trees.

Fig. 4. Root of a peach tree dying of root-rot. Part of the bark has been removed to show the white web or mat of fungus threads next to the wood.

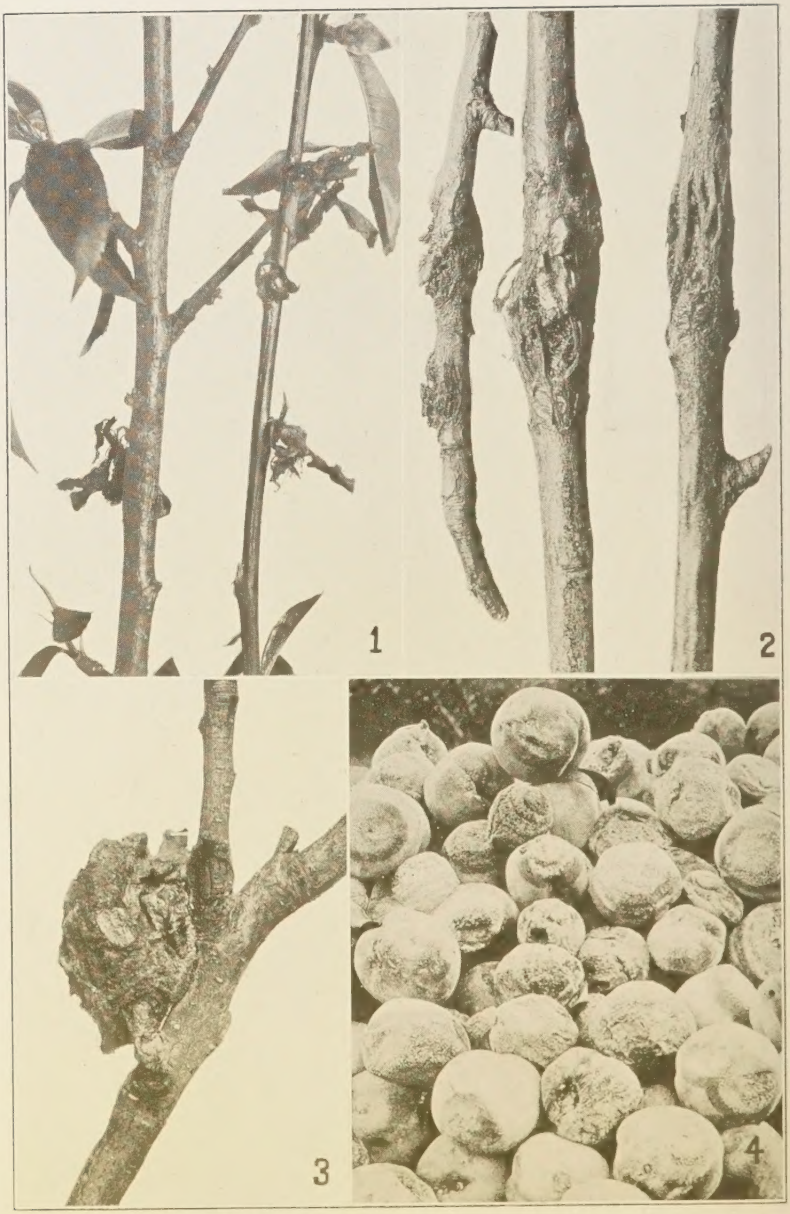
PLATE V.

Fig. 1. Peach tree 23 feet high. Some branches have been "dehorned," others have broken.

Fig. 2. "Dehorned" peach tree which made a vigorous new growth but which is completely rotted by the wood-rot fungus which entered the unprotected stubs.

Fig. 3. A properly pruned and well cultivated orchard being sprayed as a protection against insect and fungous diseases. (Cut from Hardy Sprayer Catalogue).

PLATE I



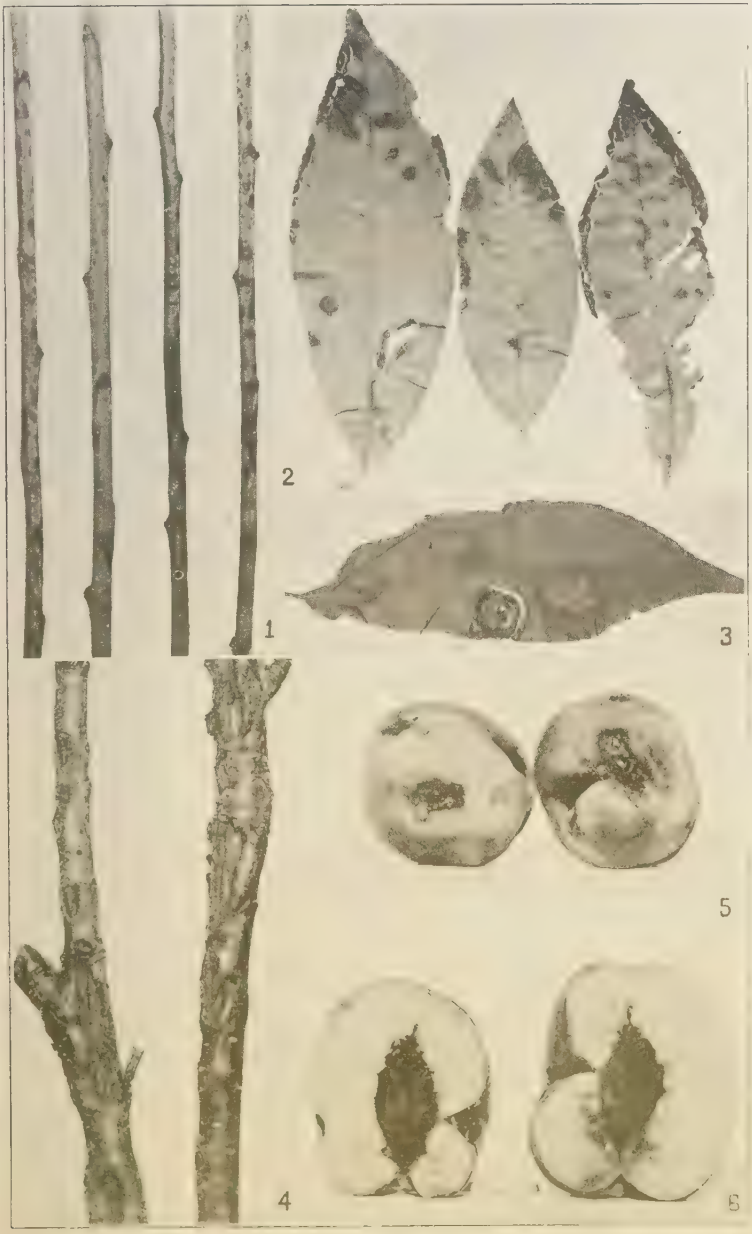
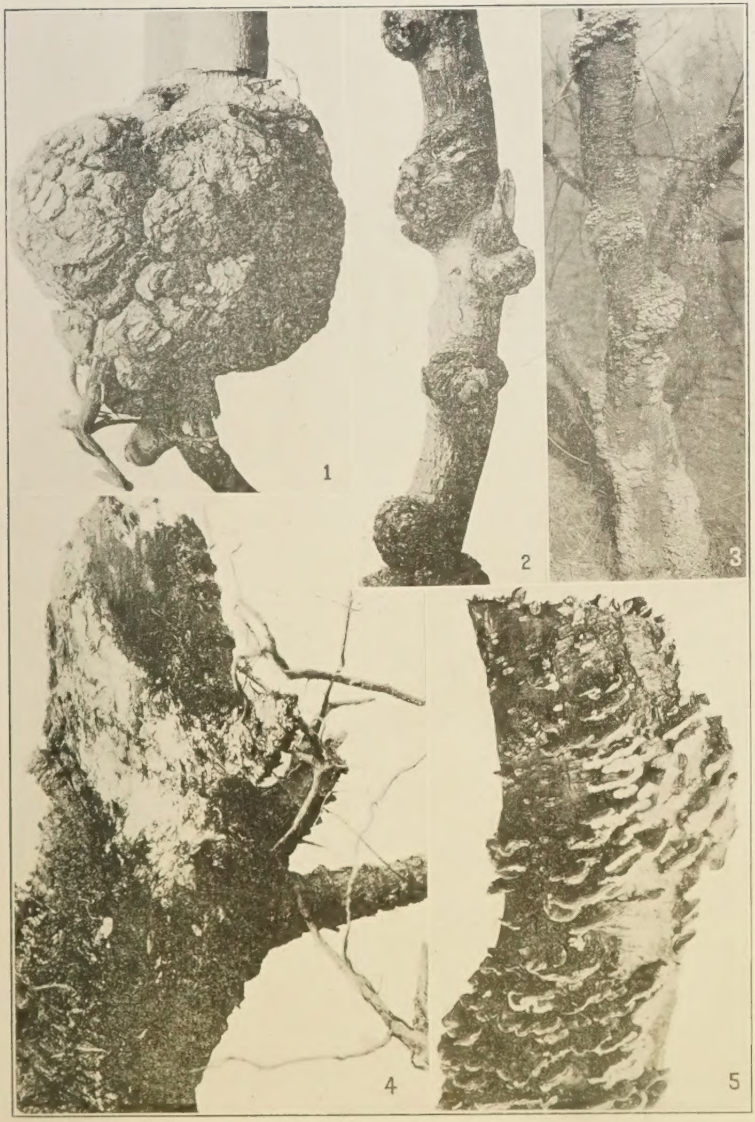
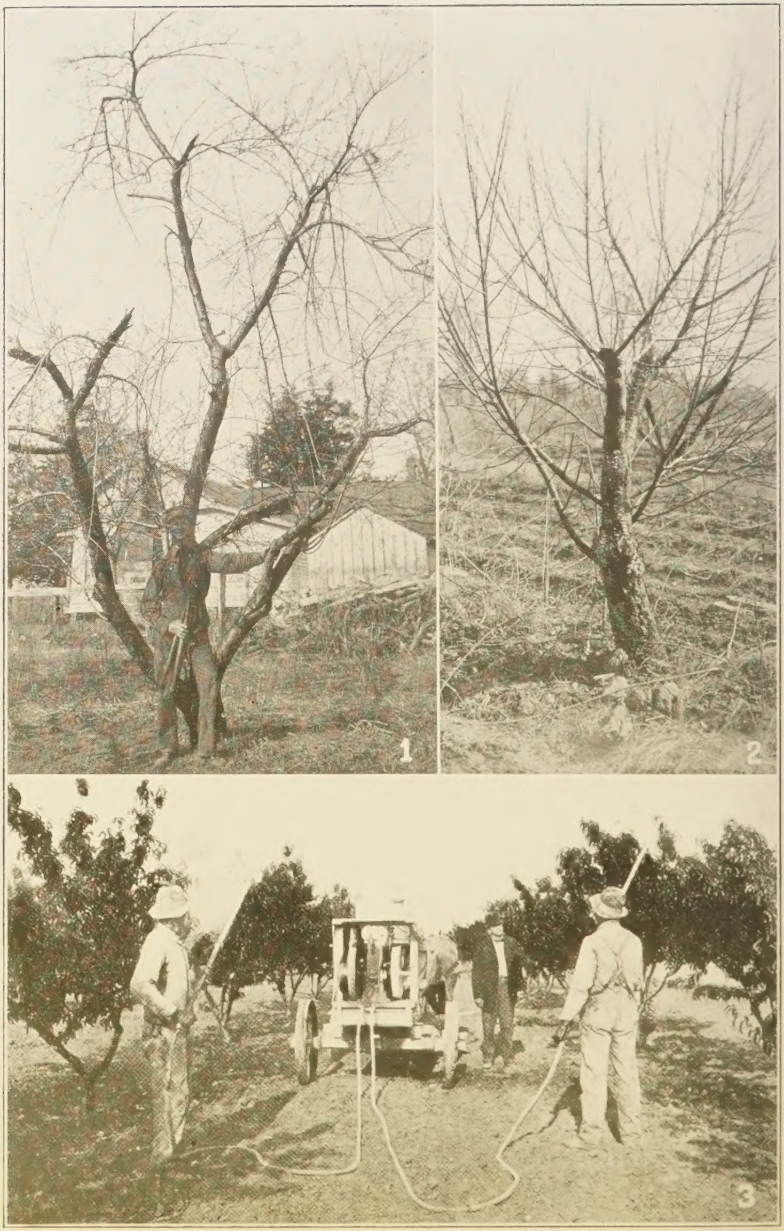

1
2
3
4
5
6

PLATE III

PLATE IV




1
2
3